

1 **(March 13, 1995)**

2 **Testing**

3 All signal control equipment shall be tested at the Washington State
4 Department of Transportation Materials Laboratory located in Tumwater,
5 Washington, prior to final delivery. The tests shall check the operation of
6 each individual component as well as the overall operation of the system.

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8 The Contractor shall designate a qualified representative for these tests.
9 Notification of this representative shall be submitted for approval, in writing,
10 to the State Materials Laboratory, 14 calendar days prior to any equipment
11 deliveries. The Engineer shall also receive a copy of this notification, which
12 includes the representative's name, address, and telephone number. All
13 communications and actions regarding testing of all equipment submitted to
14 the State Materials Laboratory shall be made through this representative.
15 These communications and actions shall include, but not be limited to, the
16 following:

17
18 All notifications of failure or rejection, demonstration of the equipment,
19 and the return of rejected equipment.

20
21 The State Materials Laboratory testing process will consist of the following
22 four separate stages:

- 23
24 a. Delivery and Assembly
25 b. Demonstration and Documentation
26 c. Performance Test
27 d. Operational Test
28

29 Testing will follow in the correct order with no time gaps between stages
30 unless mutually agreed upon by the Contractor and State Materials
31 Laboratory.

32
33 **Stage 1 Delivery Assembly**

34 All components for the complete traffic control systems, including the
35 necessary test equipment, shall be assembled and ready for
36 demonstration within ten working days of delivery to the Materials
37 Laboratory. The systems shall simulate the operations as installed in
38 the field.

39
40 Equipment and prerequisites necessary to complete this stage shall
41 include:

- 42
43 a. Detection Simulator:
44 The detection simulator shall provide at least one detector per
45 phase and variable traffic volumes. One simulator shall be
46 required for every two controllers tested.
47
48 b. Communications Network:
49 Locations, specified for coordinating communications
50 equipment and cable, shall be completely wired to provide an

operational communications system between all local and master controllers.

The Contractor shall provide labor, equipment, and materials necessary to assemble all control equipment complete and ready for demonstration. Materials and equipment used for this stage that are not required for field installation shall remain the property of the Contractor. Failure to complete this stage within ten working days will result in rejection of the entire system.

Stage 2 Demonstration and Documentation

This stage shall be completed within seven working days following the completion of Stage 1. Failure to do so shall result in rejection of the entire shipment.

All documentation shall be furnished with the control equipment prior to the start of testing. If corrections to any document are deemed necessary by the State, the Contractor shall submit this updated version prior to the final approval by the State Materials Laboratory. The documents to be supplied shall consist of or provide the following:

- a. A Complete accounting of all the control and test equipment required.
- b. A complete set of documents which shall include:
 1. Serial numbers when applicable.
 2. Written certification that equipment of the same make and model has been tested according to NEMA Environmental Standards and Test Procedures, and has met or exceeded these standards. The certificate shall include equipment model number and where, when, and by whom the tests were conducted. This certificate shall accompany each shipment of controllers.
 3. Reproducible mylar wiring diagrams and two blue-tone prints for each controller and cabinet supplied. The sheet size shall be 24 inches by 36 inches.
 4. Wiring diagrams for all auxiliary equipment furnished. One set per cabinet.
 5. Complete operations and maintenance manuals including complete and correct software listing and flow charts. One set of operations and maintenance manuals per cabinet; at least four but no more than ten. Five sets of software listings and flow charts.

- 1 6. Complete operations and maintenance manuals for
- 2 all auxiliary equipment. One set per cabinet.
- 3
- 4 c. A description of the functions and the capabilities of individual
- 5 components and of the overall control system.
- 6
- 7 d. A presentation on how to operate the system.
- 8
- 9 e. A complete and thorough demonstration to show that all
- 10 components of the control system are in good condition and
- 11 operating properly, and proof that the controller and cabinet
- 12 are functioning correctly.
- 13
- 14 f. Detailed instructions for installing and operating the
- 15 controller(s), including explanations on the use of all features
- 16 of the controller(s).
- 17
- 18 g. The operational and maintenance manuals for each traffic
- 19 signal controller supplied including as a minimum, but not to
- 20 be limited to the following:
- 21
- 22 1. Detailed instructions for maintaining all hardware
- 23 components, controller, and auxiliary equipment.
- 24
- 25 2. A complete parts list detailing all manufacturer's
- 26 identification codes.
- 27
- 28 3. Detailed wiring diagrams and schematics indicating
- 29 voltage levels and pictorial description, part name,
- 30 and location for all hardware components, controller,
- 31 and auxiliary equipment.
- 32

33 The demonstration shall include the following:

- 34
- 35 a. Phasing per plans and all phase timing.
- 36
- 37 b. Detection including any special detector functions.
- 38
- 39 c. Conflict Monitor and Load Switches.
- 40
- 41 d. Special Coordination including communication equipment.
- 42

43 This demonstration shall be performed by the Contractor in the
44 presence of State Materials personnel. The Contractor shall supply
45 any item not accounted for within five working days of the accounting.
46 Controllers and cabinets that remain incomplete five working days after
47 notification shall be rejected and returned freight collect to the
48 Contractor.
49

Stage 3 Unit Performance Test

A minimum of ten working days shall be allowed for one or two cabinet assemblies and five working days for each additional assembly.

The unit performance test will be conducted by State Personnel to determine if each and every controller cabinet assembly complies with NEMA Environmental Standards as stated in NEMA publication No. TS 1-1976, Part 2.

Any unit submitted, whose failure has been corrected, shall be retested from the beginning of this stage.

Stage 4 Operational Test

All control and auxiliary equipment shall operate without failure for a minimum of ten consecutive days. If an isolated controller is specified, it shall operate as an isolated controller. If a coordinated system is specified, it shall operate as a total coordinated system with the master and all local controllers operating in all coordinated modes.

If any failure occurs during this stage, all equipment for this stage shall be restarted following completion of repairs.

Equipment Failure Or Rejection

Equipment failures shall be defined as set forth in NEMA Publication No. TS 1-1976. Failure of load switches, detector amplifiers, and conflict monitors shall not result in rejection of the controller or cabinet. However, the Contractor shall stock, as replacements, approximately 30 percent more than the total for these three items. All excess material shall remain the property of the Contractor following completion of all tests.

If a failure occurs during Stages 3 or 4, repairs shall be made and completed within ten working days following notification of the malfunction. The Contractor shall have the option of making onsite repairs or repair them at a site selected by the Contractor. Failure to complete repairs within the allotted time shall result in rejection of the controller or cabinet assembly under test.

A total of two failures will be allowed from the start of Stage 3 to the end of Stage 4. If three failures occur during this time period, the equipment will be rejected. New equipment of different serial numbers submitted as replacement shall be received by the Materials Laboratory for testing under Stage 3 within ten working days following notification of rejection. Failure to meet this requirement within the allotted time will result in rejection of the entire system. Software errors will be considered as failures and, if not corrected within ten working days, the entire system will be subject to rejection. Following rejection of any equipment, the Contractor shall be responsible for all costs incurred. This shall include but not be limited to all shipping costs.

1 When the traffic control program is supplied by the State, the
2 Contractor shall prove that any failures are, in fact, caused by that
3 program and not the hardware.
4

5 All component or system failures, except load switches and detector
6 amplifiers, shall be documented. This documentation shall be
7 submitted prior to commencing the test or stage in which the failure
8 was found and shall provide the following information:
9

- 10 a. A detailed description of the failure.
 - 11 b. The steps undertaken to correct the failure.
 - 12 c. A list of parts that were replaced, if any.
- 13

14 Upon completion of the tests, the equipment will be visually inspected.
15 If material changes are observed which adversely affect the life of the
16 equipment, the cause and conditions shall be noted. The Contractor
17 will immediately be given notice to correct these conditions. If not
18 repaired within ten working days of notification, the equipment will be
19 subject to rejection. A final accounting shall be made of all equipment
20 prior to approval.
21

22 All failed or rejected equipment shall be removed from the Materials
23 Laboratory within three working days following notification; otherwise,
24 the failed or rejected equipment will be returned, freight collect, to the
25 Contractor.
26

27 Following final approval by the State Materials Laboratory, all
28 equipment shall be removed from the State Materials Laboratory and
29 delivered to sites as designated elsewhere in this contract.
30

31 **Guarantees**

32 The supplier shall furnish to the State any guarantee or warranty
33 furnished as a normal trade practice in connection with any equipment
34 supplied for this contract.